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Digital Nautical Chart (DNC®) Report

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1. Digital Nautical Chart (DNC) Status

NGA (National Geospatial-Intelligence Agency), Office of Global Navigation, Maritime Division completed its folio of approximately 5,000 nautical charts in DIGEST C – Vector Product Format in mid-2000 and brought the entire folio into routine maintenance in September 2004. The folio satisfies current U.S. Navy operational requirements for worldwide navigation; however, the Maritime Division continues to expand DNC coverage into some lower priority port areas. Because funding for paper chart New Editions has been curtailed, the DNC provides the best support for marine navigation in that the NGA paper products are experiencing increasing numbers of Notices to Mariners corrections and are increasingly less current than DNC.

The Maritime Division is beginning the process for ISO 9001 compliance. Additionally, several steps are being taken for quality improvement of DNC. NGA acquired a Global Shoreline Data set sourced from LandSat imagery to create a High Water Line accurate to 50-meters. This data set has a number of problems related to cloud, ice and snow cover gaps and NGA has only reviewed about 20% of the data during acceptance. However, these data are being used to identify where the larger problems exist with historic datums. NGA is reviewing the positions of islands in the data base that have been reported as being incorrectly charted and then are using the Global Shoreline Data (electro-optical imagery) in conjunction with the Shuttle Radar Topography Mission (SRTM) radar data to confirm new positions for these islands. The data also are being used to look for possible problems with coastline. While the data are NOT being made available for navigation or delineation of maritime boundaries, NGA has made the Global Shoreline Data available to the public from the NGA website. (Go to www.nga.mil ; go to Products and Services on the left of the display; go to Maritime and the Global Shoreline Data will be available according to DNC region. Users are cautioned to read the accompanying white paper on limitations of these data. Hydrographers should note that NGA did not capture the outer limit of vegetation, i.e., mangrove, as would be done for nautical charting but rather captured an approximation of the High Water Line for use in eventually defining the inter-tidal zone.

While the Global Shoreline Data set is providing a means for identification of the gross shoreline positional problems, HarborView imagery of ports is providing NGA with more accurate positioning for the large-scale port and approach charts. HarborView uses commercial imagery and provides accuracies of about 6 to 8-meters. Thus, the current phase of DNC production is to improve the quality of DNC.

2. DNC Distribution

DNC is restricted from public distribution, principally due to foreign intellectual property rights/bilateral agreement provisions. However, U.S. waters are not restricted, in accordance with U.S. law, and NGA provides DNC gratis for GIS use from the NGA Maritime website along with the digital updates. U.S. regulations have been issued to allow U.S. Federal vessels to navigate using electronic charts and publications. This same authorization applies to foreign government vessels entering U.S. waters with DNC. The Defense Logistics Agency handles hard copy and CD-ROM/DVD distribution but data availability through various web servers continues to increase.

3. DNC Deployment

The first U.S. Navy ship to complete all testing and training for ECDIS-Navy to be used for primary navigation, i.e., without hard copy chart navigation, was the cruiser USS CAPE ST GEORGE. This ship

has been on deployment since last November. This will be followed by conversion of several other ships and submarines as crew training is completed. U.S. Navy vessels are being deployed with ECDIS-N using the Northrup-Grumman, Sperry Voyage Management System (VMS).

4. Status of NGA Phase Out of Public Distribution of Hard Copy Charts

NGA is ready to shift out of lithographic chart production, but with a user that still has requirements for hard copy charts, i.e., the U.S. Navy has only begun its transition to ECDIS-N navigation, a variety of approaches are being used for phase out of NGA hard copy production. For NGA to begin withdrawal from lithographic production in the near-term requires an alternate source of hard copy charts for the U.S. Navy in English language, meters and WGS-84. NGA has begun to do so through Bilateral Chart arrangements whereby a foreign nation provides NGA with its digital print file, NGA prints only those charts needed by its government users and NGA terminates the issuance of publicly available charts for the cooperating nation. The foreign nation then receives the sales revenue. NGA is phasing this in and currently prints about 150 charts annually. There is a limit on the number that can be converted annually because the NGA Notices to Mariners system and NGA publications have to be realigned to the new coverage.

NGA also is beginning to use DNC as source for hard copy chart production. Enterprise-Product on Demand (e-POD) has been developed and NGA anticipates production of about 70 New Editions annually through this process. As each of these charts transitions to using DNC as source, the corresponding hard copy chart will be withdrawn from public availability. Withdrawal from public distribution only will be done where equivalent English language charts are available to the public so NGA termination does not impact commercial mariners in need of English language coverage.

5. ENC/DNC

NGA continues to work in support of harmonization of the ENC/DNC through DGIWG (NATO Working Group) and the TSMAD (IHO Working Group), i.e., harmonization of data definitions and extension of attribution in a common way at the data level vice the product level. The Hydrographic Information Harmonization Working Group (HIHWG) has issued its report and the mapping of features is to be made available as an XML implementation for developers in late 2006.

NGA has acquired the CARIS DOM module and has begun using IHO S-57 format data as source for the HYSAS (bathymetric) database. This is a first step toward incorporating multiple scale, one-feature one-time data into DNC. Currently, the soundings, contours and offshore hazards are to be captured but shore-side features from the multitude of large-scale charts are not being placed in continual maintenance, i.e., are not being captured. Operations requiring large-scale coverage beyond that routinely available from NGA will be handled on a case by case basis.

6. Digital Publications

NGA, Maritime Division has 78 nautical publications, all of which are in digital format. A plan is in progress to transition to all digital publications. At the end of 2004, NGA terminated the issuance of hard copy Notices to Mariners. NGA continues to provide Notice to Mariners gratis to the user, but only in soft copy from the NGA Maritime website. Rules for commercial replication of NGA publications are included in the header of the NGA Maritime Website. Several commercial firms have taken on publishing hard copy versions of the NGA publications and some value added markets have begun providing tailored products to vessels. NGA has implemented PDU (Publications Digital Update) using the same technology of VDU updating for DNC to continuously maintain the NGA digital publications up to date.

7. Systems and Software Development

The Maritime Division is cooperating with NGA InnoVision (R&D component of NGA) to develop a prototype bathymetric data base that combines all NGA bathymetric holdings into a single data base and eventually into a global elevation model.

When DNC was being developed, a Full Utility Navigation Demonstration software display system was developed in parallel to provide the U.S. Navy with a way to view the proposed display capability. For the next generation of DNC, in 2004, NGA began initial development of a capability to support and display “one-feature one-time” data, i.e., eliminate the layers of DNC (Harbor, Approach, Coastal and General) and collapse these data-layers into a variable density layer that will encompass the best feature data from these layers. This will involve utilization of the Scale Minimum (SCAMIN) attribute used by IHO. This will involve an eventual modification of GEOSYM (NGA symbols) and development of “rules” to provide for symbol generalization. NGA recently has entered a Cooperative Research and Development Agreement with Sperry to improve the functionality of ECDIS-N using DNC. This effort will be directed to adopt the new ECDIS Performance Standard, particularly the changes to alarms; rework the application software for DNC update, which is un-necessarily complicated with the Sperry system; and begin the development of the display capability for variable scale data, i.e., one-feature one-time data.

8. HarborView (3-D display)

NGA Maritime Division now uses imagery for change detection in port areas and from the resulting imagery, Digital Terrain Elevation Data and DNC, produces a 3-D display for U.S. Navy navigation planning, port protection, and underway situational awareness. HarborView has been integrated with GPS/DGPS. Over two-hundred ports have been completed and another 100 ports are in work of the 1,700 ports in DNC. This product is not available to the public, but can be shared through bilateral arrangements.